

Masakane INOUE*: **Japanese species of
Hulia (Lichenes) (2)****

井上正鉄*: 日本産フイリア属地衣について (2)

3) ***Hulia chungii* (Zahlbr.) M. Inoue, comb. nov.** (Figs. 1, 3A, 8a)

Lecidea chungii Zahlbr. in Handel-Mazzetti, Symbol. Sinic. 3: 96 (1930).

Type: China, Fukien, Gu-schan bei Fudschou, 500-600 m alt., leg. H. H. Chung 608 a—holotype in W.

Thallus effuse, medium to thick, irregularly areolate-verrucose, verrucose-granulate or subtartareous, opaque, contiguous, or in part evanescent, ash-gray with green tinge; medulla I—. Hypothallus indistinct.

Apothecia up to 1.1 (rarely to 1.5) mm in diameter, adnate or appressed-adnate, moderately or slightly constricted at the base, sometimes surrounded by an unusual thallus and becoming subimmersed in the thallus; disc epruinose, flat with a thin margin at the juvenile stage, then becoming slightly convex with a ± obliterated margin. Excipulum 70-100 μm thick, reddish brown to dark brown in external part and becoming gradually paler towards the center, or frequently colorless especially in younger apothecia, K+ reddish; hyphae subradiating, irregularly entangled, 3-4 μm thick, with a rather thin wall. Epithecium blackish to dark brown with green tinge. Hymenium (50) 60-90 μm high. Subhymenium (30) 50-80 μm high, with perpendicular hyphae. Hypothecium dark reddish-brown, with various heights, reaching 150 μm high, K+ reddish; hyphae irregularly arranged. Paraphyses coherent, anastomosed, slender, 1.5-2.5 μm thick; apices slightly swollen, 3-3.5 μm thick. Asci clavate, 60-70 \times 10-14 μm . Spores ellipsoid with obtuse ends, (12) 14-20 \times 7-10 μm , with a thin wall.

Reaction: thallus and medulla P-, K- (or brownish), KC-, C-. Chemical substances: *Hulia*-1 (main), confluentic acid (small amount) and an unidentified minor constituent.

Habitat. On non-calcareous rocks in the lowlands and mountain regions.

Range. Japan and China.

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** Continued from Journ. Jap. Bot. 58: 113-128, 1983.

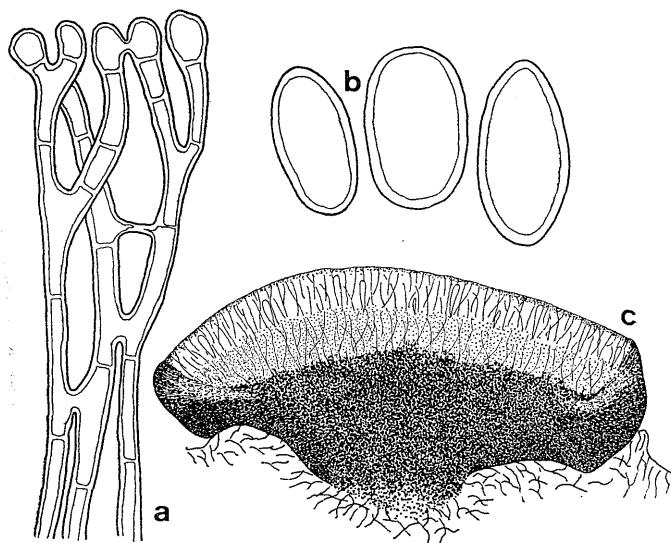


Fig. 1. *Huilia chungii* (Zahlbr.) M. Inoue (drawn from HIRO-Inoue 7338). a. Upper part of paraphyses, $\times 700$. b. Spores, $\times 700$. c. Vertical section of apothecium, $\times 42$.

The type specimen of *H. chungii* is very meager, bearing only a few apothecia. However, this species is clearly characterized by the irregularly areolate-verrucose or verrucose-granulate thallus which is ash-gray with green tinge and rather high subhymenium ($50-80 \mu\text{m}$ high) within the genus.

On account of its colorless internal excipulum especially in younger apothecia, this species may be reminiscent of species of *Lecidea*, but it is clearly classified under the genus *Huilia*, because of the presence of an excipulum composed of radially arranged hyphae derived directly from the hypothecium. The same hyphal arrangement can be seen in the excipulum of *Huilia albocaeruleascens*.

Specimens examined. Honshu. Pref. Shizuoka. Mt. Kinkan, Idzu Peninsula, mi 11430. Pref. Hiroshima. Mt. Oozuchi, mi 7206; Iguchi isl., mi 7186; Mt. Noro, mi 1986, 2010, 7338, 7382 & 10972; Mt. Yasumiyama, mi 7131, 7138, 7145 & 7149; Shiwa, mi 10942, 10952 & 10965; Hachihonmatsu, mi 9179, 11705 & 11706; Mt. Kinmei near Kabe, mi 11168; Nabara Gorge, mi 12000; Asa, mi 102; Mt. Tenjo, mi 12080; Kuroutsu Gorge, mi 11881; Mt. Mado, mi 11159; Ishigatani

Gorge, mi 8000; Okimi, mn 4129; Miyajima isl., mi 2508, 2707, 2965, 3553, and 16 others; Yasaka Gorge, mi 11757, 11762 & 11822; Mt. Mikura, mi 11148, 11152 & 11153; Okutanijiri, mi 12035. Pref. Shimane. Minamiyama near Yunotsu, mi 11659 (coll. T. Nakano). Pref. Yamaguchi. Datoko near Tokuyama, mi 12072 & 13947. Kyushu. Pref. Nagasaki. Mt. Unzen, mi 9831.

4) ***Hulia crustulata* (Ach.) Hertel**, Herzogia 3: 373 (1975). (Figs. 2, 3B, 8 b)

Lecidea parasema var. *crustulata* Ach., Lich. Univ. 176 (1810). Type: Switzerland, leg. J. Schleicher 690—lectotype (Hertel 1975) in H (Herb. Acharius 152B)—*Lecidea crustulata* (Ach.) Spreng., Syst. Veget. 4: 258 (1827).

Lecidea meiospora auct. non (Nyl.) Nyl.; Nyl., Lich. Jap. 72 (1890).

Thallus thin, effuse, rimulose, tartareous, or obsolete, whitish, opaque; medulla I—. Hypothallus indistinct.

Apothecia up to 1 (rarely to 1.2) mm in diameter, adnate, black, prominently or moderately constricted at the base; disc epruinose, flat with a prominent entire margin at the juvenile stage, then becoming slightly convex with ± obliterated margin. Excipulum 50–100 μm thick, K+ yellow, reddish brown to dark brown in external part and becoming gradually paler towards the center, but not colorless; hyphae radiating, 4–7 μm thick, with a thick wall. Epithe-

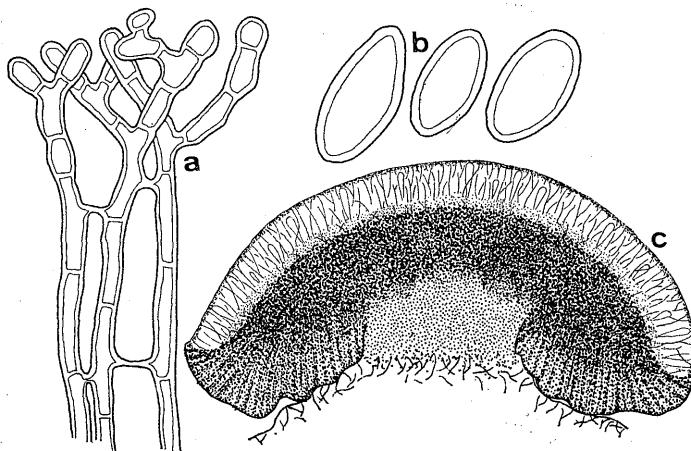


Fig. 2. *Hulia crustulata* (Ach.) Hertel (drawn from HIRO-Inoue 5142). a. Upper part of paraphyses, $\times 700$. b. Spores, $\times 700$. c. Vertical section of apothecium, $\times 42$.

cium greenish brown to brown, Hymenium 50–80 μm high. Subhymenium 10–20(30) μm high, colorless, with perpendicular hyphae. Hypothecium reddish to dark brown, variable in height and sometimes up to 150 μm high, K+ reddish; hyphae irregularly arranged. Paraphyses slender, 1.5–2 μm thick, coherent, anastomosed; apices not or slightly swollen (3–3.5 μm thick). Ascii clavate, 45–55×8–12 μm . Spores ellipsoid with obtuse ends, 11–17 (20)×5–9 μm , walls about 1 μm thick.

Reaction: thallus and medulla P+ brick red, K+ yellow, KC-, C-. Chemical substances: stictic acid, but rarely no lichen substance is demonstrated with thin-layer chromatography (TLC).

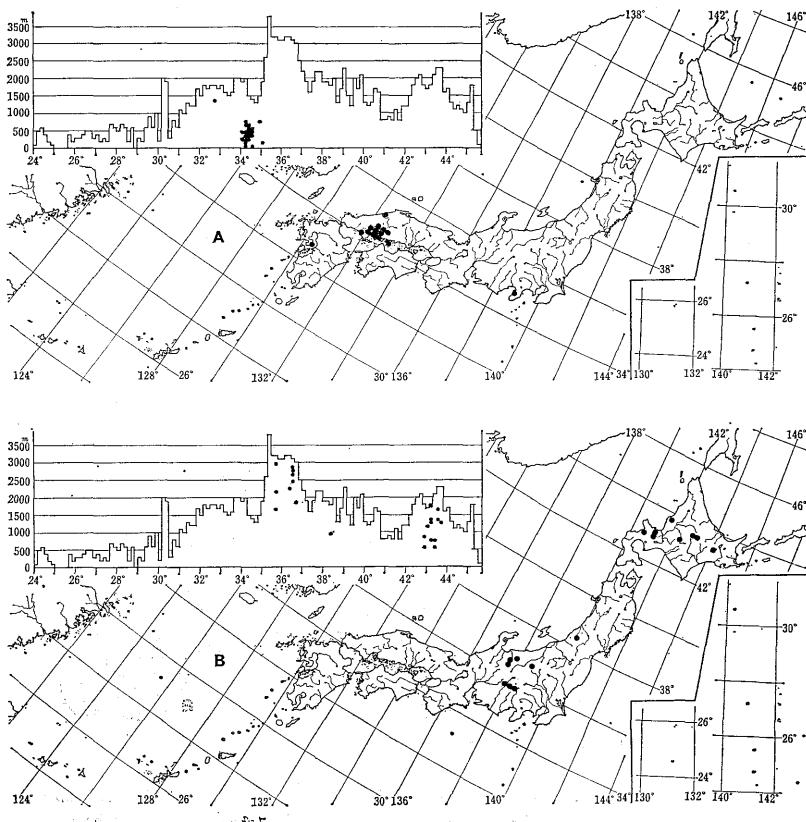


Fig. 3. Distribution of *Huilia chungii* (A) and *Huilia crustulata* (B) in Japan.

Habitat. On non-calcareous rocks in subalpine and alpine regions.

Range. Japan, Asia, Europe, North America, Scandinavia and Venezuela.

This species is closely related to *Hulia macrocarpa*, because they both have a similar hyphal structure of the excipulum and produce stictic acid (I did not test the lectotype specimen with TLC because it is too fragmental). Vainio (1934) drew attention to a difference of a hymenial height between these two species; 50–70 µm high in

H. crustulata in contrast to 80–125 µm high in *H. macrocarpa* (as *Lecidea steriza*). Hertel (1975, 1977) separated the two species by differences in the sizes of apothecia and spores; apothecia are up to 1 mm across and spores 12–22 × 6–10 µm in *H. crustulata*, while up to 3 mm across and 17–33 × 7–14 µm in *H. macrocarpa*. On the contrary, for example, Harris (1977) stated, "In Michigan I have found this group so viable and overlapping that I feel it is not worth my time or anyone's time to try to separate them". However, the results of careful studies on rich materials from Japan indicate that these two can be better separated as distinct species. *H. crustulata* is distinguished from *H.*

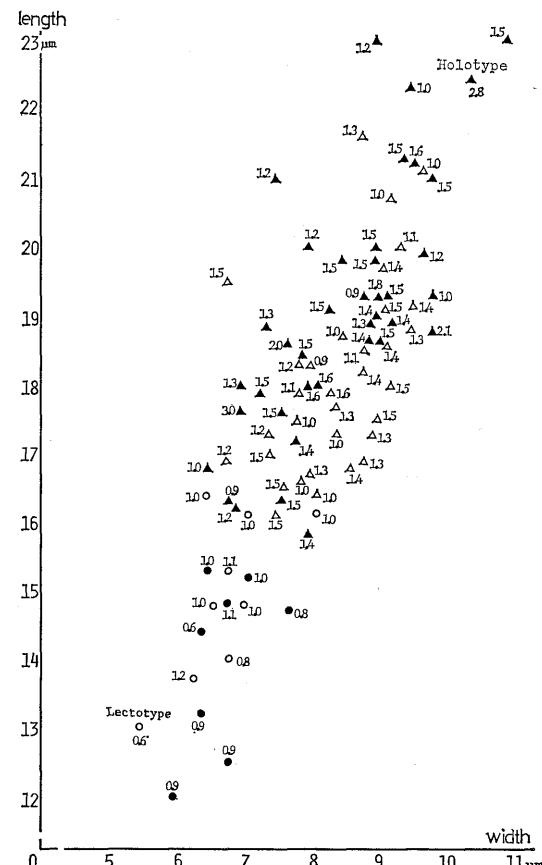


Fig. 4. Scatter diagram illustrating the distribution of three characters in *Hulia crustulata* (●, ○) and *H. macrocarpa* (▲, △): mean spore size, extreme apothecial size (figures), and hymenial height (●, 60–70 µm; ○, reaching 90–110 µm; △, reaching 90 µm; ▲, 90–110 µm).

macrocarpa by having a lower hymenium (50–80 μm , while 70–120 μm in *H. macrocarpa*), and smaller spores (11–17 \times 5–9 μm , while 14–26 \times 6–11 μm in *H. macrocarpa*), though the size of apothecia does not seem to be reliable for separating them (Fig. 4).

Specimens examined. Hokkaido. Prov. Kamikawa. Mt. Midori, Mts. Daisetsu, mi 8540; Mt. Ashibetsu, mi 8801, 8824, 8830 & 8839. Prov. Kushiro. Mt. Oakan, mi 8754 & 8762. Prov. Tokachi. Mt. Otofuke, mi 8398. Prov. Ishikari. Mt. Tengu, mi 8075, 8078 & 8079. Prov. Rumoi. Mt. Syokanbetsu, mi 8314. Prov. Shiribeshi. Mt. Mekunnai, mi 8887. Honshu. Pref. Yamagata. Mt. Itou, mi 10504. Pref. Toyama. Mts. Tateyama, mi 12854 & 12865; Mt. Tsurugi, mi 12906. Pref. Nagano. Mt. Tsubakuro, mi 5142; Shiga Heights, mi 1578; Mt. Norikura, Mts. Shirouma, mi 12979; Mt. Kisokoma, mi 6617. Pref. Yamanashi. Mt. Kitadake, mi 12167 & 12148.

5) ***Huilia elegantior* (H. Magn.) Hertel, Herzogia 3: 373 (1975). (Figs. 5 a–c, 6A, 8c)**

Lecidea panaeola f. (*) *elegans* Th. Fr., Nova Acta Reg. Soc. Sci. Upsal., ser. 3, 3: 307 (1861)—*Lecidea elegans* (Th. Fr.) Vain., Acta Soc. Fauna Flora Fenn. 57 (2): 151 (1934), nom. illegit. [non *Lecidea elegans* (Müll. Arg.) Zahlbr. 1925]—*Lecidea elegantior* H. Magn., Fört. Skand. Växter, 4, Lav. 29 et 85 (1937). Type: Norway, Finnmark, Varanger, Styrene, leg. Th. Fries—lectotype (Hertel 1977) in UPS; isolectotype in M.

Thallus contiguous, thick, white with gray tinge, or creamy, or pale tawny, irregularly areolate; areolae bullate, with perpendicular edges; surface smooth and polished; medulla I—. Violet-brownish cephalodia intermixed with areolae. Hypothallus black, visible between the areolae.

Apothecia appressed-adnate, 0.5–1.5 mm in diameter, not or slightly constricted at the base, blue-black to black; disc flat with a prominent thickish margin in younger stages, then becoming slightly convex with obliterated margin, with white pruina. Excipulum 50–80 μm thick, reddish to dark brown in external part and becoming gradually paler towards the center, but not colorless, K+ reddish; hyphae subradiating, irregularly entangled, 3–4 μm thick, with a somewhat thickened wall. Epitheciun greenish brown to brown. Hymenium 90–130(150) μm high. Subhymenium 40–60 μm high, colorless, composed of perpendicular hyphae. Hypothecium dark reddish brown, variable in height, reaching 200 μm high, K+ reddish; hyphae irregularly arranged. Paraphyses

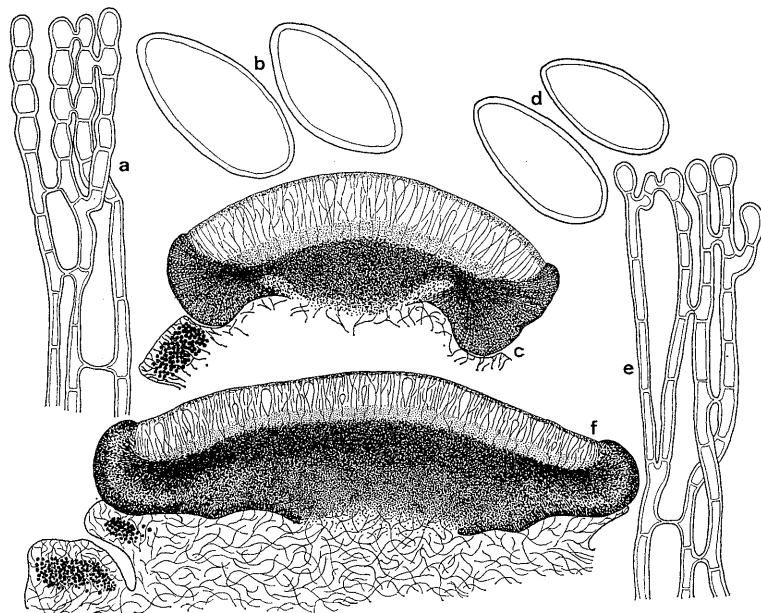


Fig. 5. *Hulia elegantior* (H. Magn.) Hertel (a-c: drawn from HIRO-Inoue 11629) and *H. flavicunda* (Ach.) M. Inoue (d-f: drawn from HIRO-Inoue 10722). a and e. Upper part of paraphyses, $\times 450$. b and d. Spores, $\times 450$. c and f. Vertical section of apothecia, $\times 27$.

slender, 1.5–2 μm thick, coherent, anastomosed; apical cells more or less moniliiform. Asci clavate, 70–90 \times 15–20 μm . Spores ellipsoid with subacute ends, 25–30(35) \times 8–13 μm ; walls about 1 μm thick.

Reaction: thallus P-, K-, KC-, C+ chinese red and medulla P-, K-, KC-, C- in the chemical race I, thallus & medulla P-, K-, KC-, C- in the chemical race II. Chemical substances: gyrophoric acid in chemical race I; confluentic acid, glomeriferic acid (small amount), and Lecidea-2 in chemical race II.

Habitat. On non-calcareous rocks in alpine regions.

Range. Japan, Arctic regions, Europe, Himalaya, North America, and Scandinavia.

The Japanese specimens agree very well with the lectotype both morphologically and anatomically. However, they include two chemical variants; one (chemical race I) contains gyrophoric acid as a major constituent as in the type

specimen, and the other (chemical race II) contains confluentic acid (C-). The chemical race II is more abundant than the chemical race I in Japan; 16 specimens belonging to chemical race II have been collected, while only one of chemical race I. Further materials, especially from outside of Japan, and further studies on the chemistry are required for the final decision on taxonomical treatment of these chemical variants.

Specimens examined. Hokkaido. Prov. Tokachi. Mt. Otofuke, mi 8440. Honshu. Pref. Toyama. Mt. Shirouma, mi 14143. Pref. Nagano. Mt. Norikura, Mts. Shirouma, mi 12947, 12964, 12986, 13000 & 13013; Mt. Goryu, mi 5588; Mt. Tateshina, mi 11629; Mt. Kokushi, mi 1353. Pref. Yamanashi. Sensui Pass, Mt.

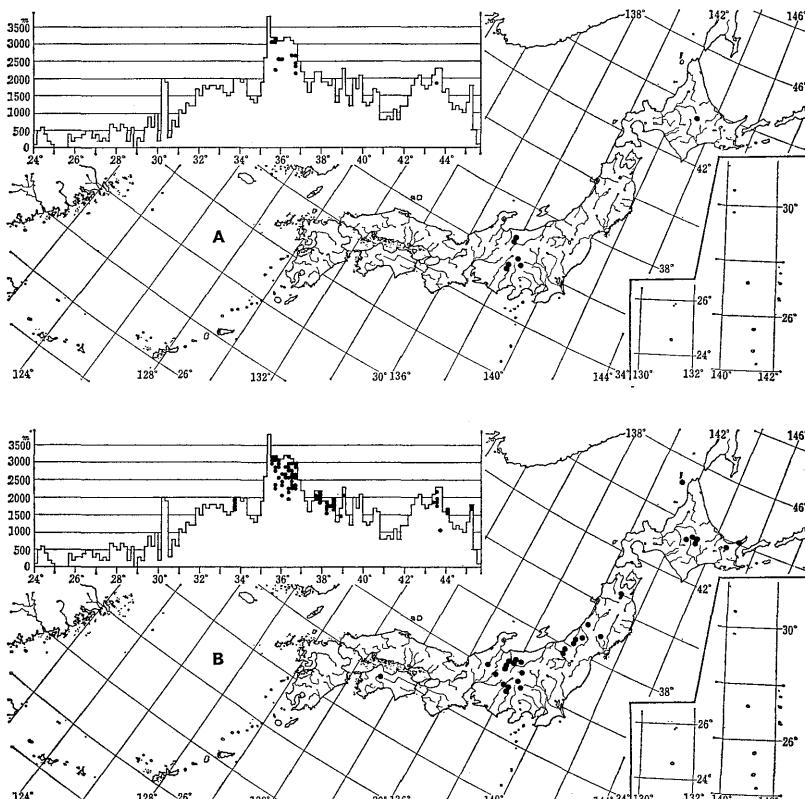


Fig. 6. Distribution of *Huilia elegantior* (A) and *Huilia flavicunda* (B) in Japan.

Kaikoma, mi 12295, 12318 & 12323; Mt. Kitadake, mi 12219 & 12293; Mt. Ainotake, mi 12374.

6) ***Hulia flavicunda* (Ach.) M. Inoue, comb. nov.** (Figs. 5d-f, 6B, 8d)

Lecidea flavicunda Ach., Lich. Univ. 166(1810). Type: Switzerland, "in axis montium Helvetiae", leg. Schleicher—holotype in H (Herb. Acharius 301A).

Lecidea albocaerulescens var. *flavocaerulescens* auct. non (Hornem.) Schaer.; Zahlbr., Bot. Mag., Tokyo 41: 329 (1927)—*Lecidea flavocaerulescens* auct. non Hornem.; M. Inoue, Misc. Bryol. Lichenol. 7: 112 (1976).

Thallus indeterminate to subdeterminate, medium to thickish, contiguous, or rarely in part evanescent, irregularly cracked-areolate or areolate, rusty orange, or sometimes fading out, ash-white; areolae angular, flat or subconvex, smooth, more or less polished; medulla I-. Hypothallus ±indistinct, black, encircled.

Apothecia appressed-adnate, or adnate, 0.5–1.8 mm in diameter, rarely to 2.5 mm, not or slightly constricted at the base; margin thin to moderate, entire, sometimes flexuous, blackish brown to black; disc with ash-white pruina, flat at the juvenile stage, then becoming convex. Excipulum 50–100 μm thick, reddish to dark brown in external part and becoming gradually paler towards the center, K+ reddish; hyphae subradiating, irregularly entangled, 2–3 μm thick, leptodermatous. Epithecium greenish brown to brown. Hymenium 60–110(130) μm high. Subhymenium 30–40(60) μm high, colorless, composed of perpendicular hyphae. Hypothecium dark reddish brown, variable in height, reaching 250 μm high, K+ reddish; hyphae irregularly arranged. Paraphyses coherent, anastomosed, 2–2.5 μm thick; apices slightly swollen, 4–5 μm thick. Ascii clavate, 50–85 \times 15–20 μm . Spores ellipsoid with subacute ends, (15)17–22(26) \times 8–13 μm ; walls rather thickish to moderate, 1–1.5 μm thick.

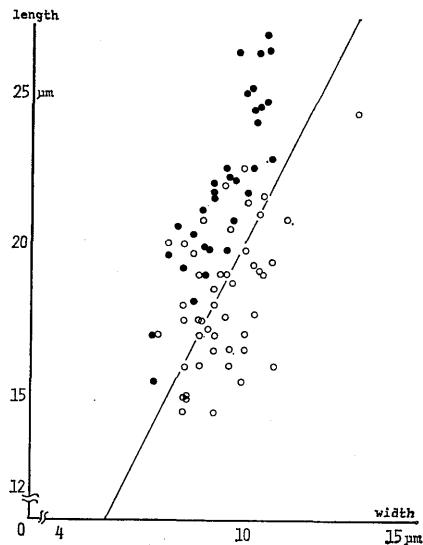


Fig. 7. Mean spore size distribution in *Hulia albocaerulescens* var. *albocaerulescens* (●) and *H. flavicunda* (○).

Reaction: thallus and medulla P-, K-, KC-, C-. Chemical substances: confluentic acid, glomeriferic acid (extremely small amount or -) and Lecidea-2.

Habitat. On non-calcareous rocks in subalpine and alpine regions.

Range. Japan and Europe.

Degelius (1938) stated, "According to my idea, there are two types of *Lecidea flavocaerulescens*: one fertile, without soredia and one sterile, soredious the forms mentioned above belong to one and the same species", and he reduced *Lecidea flavicunda* which was fertile and without soredia as a synonym of *L. flavocaerulescens* which was sterile and soredious. Hertel (1977) reached the same opinion and transferred *L. flavocaerulescens* to *Huilia*. I, however, think that the existence of soredia is taxonomically important. Accordingly it should be better to apply Poelt's "Artenpaare" concept (Poelt 1970, 1972) and to maintain *L. flavicunda* (= *Huilia flavicunda*) as a distinct species.

Hertel (1977) reported *Huilia flavocaerulescens* from Japan based on a specimen cited by Zahlbruckner (1927) as *Lecidea albocaerulescens* var. *flavocaerulescens*. However, the specimen should be identified as *H. flavicunda* because of the presence of apothecia and the lack of soredia. *H. flavocaerulescens*, which is a counterpart of *H. flavicunda*, has not been known in Japan.

Huilia flavicunda is closely related to *H. albocaerulescens*, but it is easily distinguished from the latter species by a cracked-areolate rusty orange thallus, paraphyses with very coherent tips, somewhat shorter spores (Fig. 5), and production of confluentic acid. In Japan this species is distributed in higher altitudes than *H. albocaerulescens* does. The rusty orange color of the thallus of *H. flavicunda* is usually stable, however, a few faded plants are also found; some are whitish or glaucous, others are both rusty orange and glaucous. The faded plants are most reminiscent of *H. albocaerulescens*, from which it is easily distinguished by the above mentioned characters.

In The Naturhistorisches Museum Wien (W), I have found a specimen, "Schleicher 32a, Helvetia" on which packet Acharius himself might handwrite as "*Lecidea flavicunda*". Perhaps this may be a part of the syntypes; it contains confluentic acid as a major substance as in the Japanese specimens (TLC).

Specimens examined. Hokkaido. Prov. Soya. Mt. Rishiri, mi 8097, 8165 & 8170. Prov. Kamikawa. Mt. Hakuun, Mts. Daisetsu, mi 8594, 8602 & 8603; Mt. Chubetsu, Mts. Daisetsu, mi 8708; Mt. Tomuraushi, H. Kanda 496 & 525, mi 8635; Mt. Furano, mi 7948. Prov. Tokachi. Mt. Otofuke, mi 8444 & 8462; Mt.

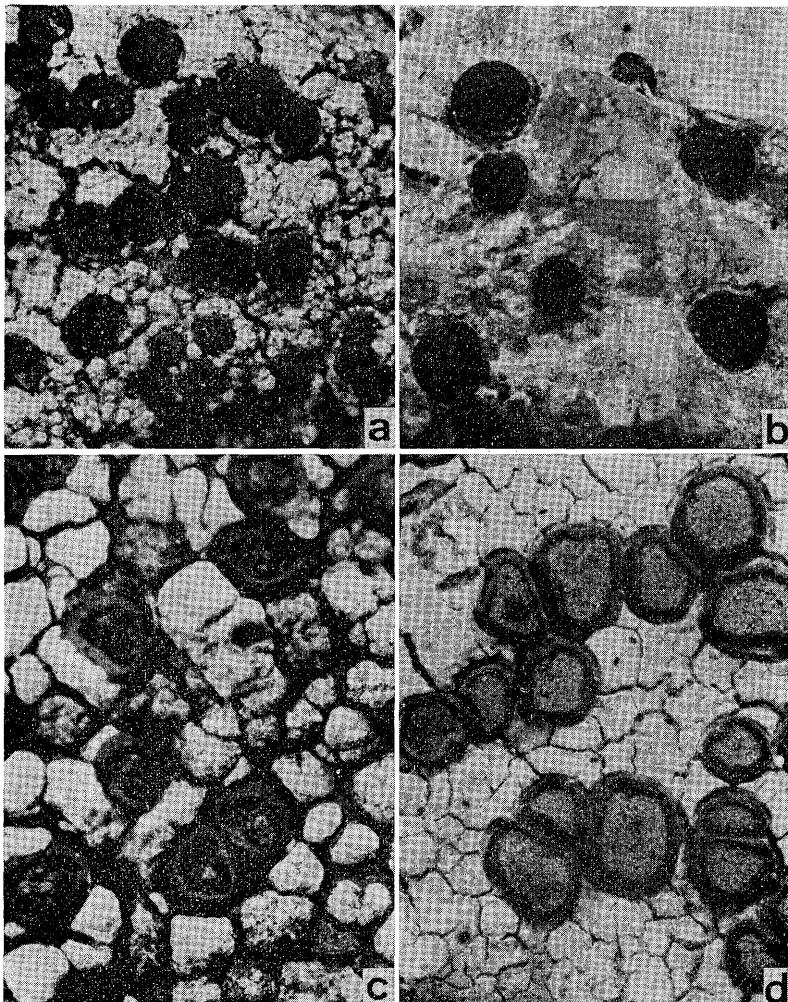


Fig. 8. a. *Huilia chungii* (Zahlbr.) M. Inoue (mi 7338). b. *Huilia crustulata* (Ach.) Hertel (mi 5142). c. *Huilia elegantior* (H. Magn.) Hertel (mi 11629). d. *Huilia flavigunda* (Ach.) M. Inoue (mi 10722). $\times 15$.

Nipesotsu, mi 8950 & 9004. Prov. Abashiri. Mt. Shari, mi 8350; Mt. Rausu, mi 7777. Honshu. Pref. Aomori. Mt. Hakkoda, M. Sato 198 (as *Lecidea alpicola* Sato in sched.), TNS. Pref. Miyagi. Mt. Kurikoma, mi 10376. Pref. Yamagata.

Mt. Chokai, mi 15913; Mt. Gassan, mi 10788, 10795, 10801, 10808, 10818, 10824, 10826 & 10827; Mt. Itou, mi 10473 & 10478; Mt. Asahi, mi 10534, 10544, 10560 & 10640; Mt. Iide, mi 10841, 10852, 10912 & 10914; Ubayu, Faurie 5848, KYO. Pref. Niigata. Mt. Dainichi, mi 10668. Pref. Toyama. Mts. Tateyama, mi 12872; Mt. Shirouma, mi 14162. Pref. Nagano. Mt. Takatsuma, Mts. Togakushi, mi 11295; Tenguhara, Mts. Shirouma, mi 5735; Mt. Korenge, mi 5632; Mt. Shirouma, mi 14100; Mt. Karamatsu, mi 5795, 5800 & 5830; Mt. Goryu, mi 5418 & 5515; Mt. Kashimayari, mi 5365 & 5415; Mt. Jii, mi 5457 & 5464; Mt. Harinoki, mi 6048; Mt. Kitakazura, mi 5005 & 10353; Mt. Funakubo, mi 5055; Mt. Mitsu-dake, mi 5992, 6016 & 12739; Mt. Noguchigoro, mi 5887; Mt. Washiba, mi 5966; Mt. Eboshi, mi 12749; Mt. Yari, mi 4852; Mt. Cho, mi 14250 & 14307; Mt. Jonen, mi 14180 & 14211; Mt. Azuma, k 50254, TNS; Mt. Kagonoto, mi 585, 595, 614 & 637; Mt. Tateshina, k 540349, TNS, mi 11608, 11619 & 11649; Mt. Kinpu, k 520202, TNS, mi 10722; Mt. Ontake, mi 4680, 4720, 4730, 11449, 11535, 11548 & 11549; Mt. Kisokoma, A. Yasuda 704, TNS, mi 6596, 6669 & 6720. Pref. Ishikawa. Mt. Hakusan, S. Nakanishi 67073. Pref. Yamanashi, Mt. Kokushii, mi 1278; Sensui Pass, Mt. Kaikoma, mi 12333 & 12334; Mt. Kitadake, mi 1049, 12166, 12440 & 12291; Mt. Ainotake, mi 1085, 12375, 12380, 12400. Shikoku. Pref. Ehime. Mt. Ishizuchi, mi 10995, 10996, 10998 & 10999.

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日本産フイリア属の4種について各々の形態・地衣成分・地理分布を記載し、近縁種との関係を論じた。内2種については新組み合わせを提唱した。*Huilia crustulata* は研究者によつては *Huilia macrocarpa* の異名とみなされているが、筆者は子のう層の厚さ、胞子の大きさで両者が区分される事を述べた。*H. elegantior* にはジロフォール酸を含むものと、コンフルエンチン酸を含むものが確認された。ところで、*H. elegantior* の lectotype はジロフォール酸を含有している事を本研究で明らかにしたが、日本産の場合は17点中にわずか1点の標本にこれがみられたにすぎない。この種の chemical variant は日本以外の地域ではどうなつてゐるのか、種分化など考へる場合、興味がもたれる。Zahlbruckner (1927) は山形県の姥湯産の標本に基づいて *Lecidea albocaerulescens* var. *flavocaerulescens* を報告し、Hertel (1977) もこの標本を見てこれを *Huilia* 属の独立種と考え、*H. flavocaerulescens* を提唱した。しかし、姥湯産をはじめとする日本産のものは、粉芽を備えず有子器であるため、粉芽を備え無子器の *H. flavocaerulescens* と同一種とは認め難いので、日本産のものは *Huilia flavicunda* (Ach.) M. Inoue として報告した。*H. flavocaerulescens* と *H. flavicunda* は Poelt (1970, 1972) のいう “species-pair” を形成しているが、前者の日本における分布は今のところ確認されていない。

□日下田紀三：屋久島の四季 127 pp. (内 104 pls.) 1982. 八重岳書房、東京. ¥5,800.
屋久島は有名である。本書は自然と人文との両面をねらっている。ヤクシマシャクナゲの開花や老杉のたたずまいなど毎度のことながらたくましい。ただ屋久島は自然の島として評判の島だからもう少し自然の表情を載せて欲しかったと思う。巻末には宮脇・鈴木両氏の屋久島の植物と植生、岡留氏の屋久島の動物、三木氏の屋久島の歴史及び著者による風土と生活が載せてある。

(前川文夫)

□本間 啓 (監修)：世界と日本の街路樹 192 pp. 1982. 日本交通公社、東京. ¥2,000.
世界の主要都市の街路樹を写真と文章とから軽く擱ませようとしたもので、それなりに豊富な写真は眼を楽しませるし、街路樹種の特徴と見分け方や世界の主要都市の主な街路樹一覧などを苦心して作られていると思う。ただ、風景写真に街路樹が見えにくかったり、東京の街路樹になぜか秋口が多いのも一寸気掛りであったし、p. 152 にあるけれども、日本も世界の主要都市として加えて欲しかった気がする。

(前川文夫)